

# An Account of the Species of the Red Alga *Polysiphonia* of the Central and Western Tropical Pacific Ocean

## II. *Polysiphonia*<sup>1</sup>

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ABSTRACT: Seven polysiphonous species are described. Three species are new: *Polysiphonia dotyi*, *P. pentamera*, and *P. tsudana*. *P. howei* proves to be a very widely distributed species. *P. exilis* and *P. tepida* were previously known from the tropical Atlantic Ocean. *P. homoia* was previously known from the Pacific coast of Mexico. Of the polysiphonous species of *Polysiphonia* represented by the present study, none are corticated.

### KEY TO THE SPECIES (continued from Part I)

26. Epizoic; erect branches 45–50 $\mu$  in diameter ..... *P. tsudana*
26. Not epizoic; erect branches 100 $\mu$  or more in diameter ..... 27
27. With 5 pericentral cells ..... 28
27. With 7 or more pericentral cells ..... 29
28. Chiefly erect from a basal tuft of rhizoids; trichoblasts at intervals of 2–3 segments; segments of main branches mostly 1.5 diameters long or longer ..... *P. homoia*
28. Chiefly prostrate or decumbent; trichoblasts at intervals of 5 or more segments; segments of main branches 1 diameter long or shorter ..... *P. pentamera*
29. Trichoblasts and scar-cells at infrequent intervals; plants of estuaries and harbors ..... *P. tepida*
29. Trichoblasts and scar-cells commonly one per segment ..... 30
30. Pericentral cells in longitudinal rows; wall-scars relatively prominent where trichoblasts shed ..... *P. exilis*
30. Pericentral cells in offset positions in successive mature segments ..... 31
31. Rhizoids cut off as separate cells from the distal end of the pericentral cells; pericentral cells not tumid ..... *P. howei*
31. Rhizoids remaining in open connection with the pericentral cells; pericentral cells mostly tumid ..... *P. dotyi*

### *Polysiphonia dotyi* sp. nov.

Fig. 1A, 1B, 4, 5

Chiefly prostrate or sometimes clambering algae; prostrate and erect branches mostly 140–

160 $\mu$  in diameter; rhizoids unicellular with a broad open connection with the pericentral cells and with mostly discoid or occasionally multicellular apices; erect branches frequent, 0.5–1.0–(10) mm high, with segments mostly shorter than broad and tumid, especially above; lateral branches few, arising in association with trichoblasts; pericentral cells mostly 8–10, ecorticate, arranged in offset positions in successive segments; trichoblasts one per segment with a right hand spiral turn of one pericentral cell between successive trichoblasts, mostly rudimentary but occasionally to 1.2 mm long, with

<sup>1</sup> Acknowledgments and designations used for collectors are given in Part I of this series (Pacific Science 22(1):56–98). The material collected by C. R. Long, and reported in Parts I and II of this account, was collected under the auspices of the Pacific Ocean Biological Survey Program conducted by the Division of Birds, Smithsonian Institution.

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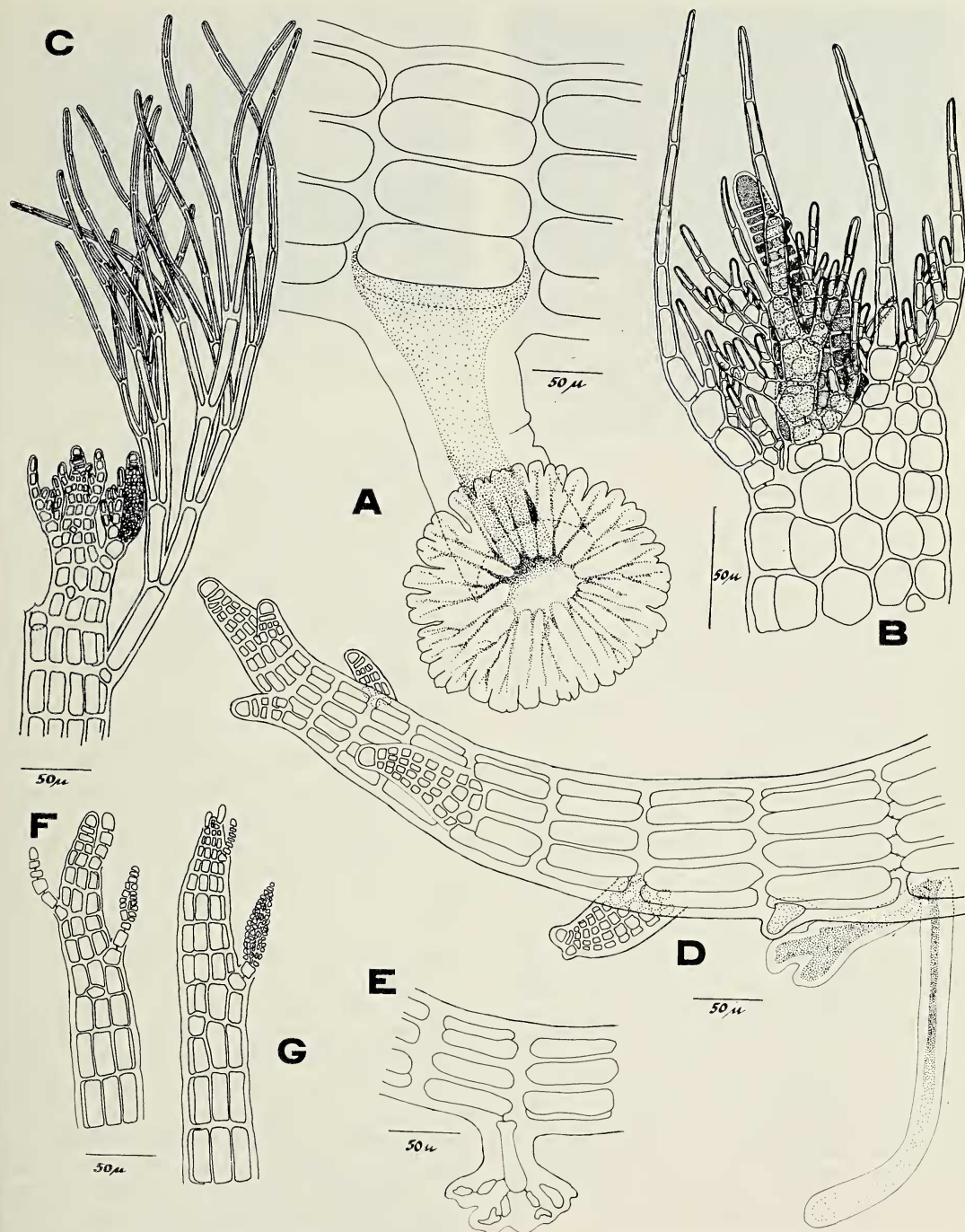


FIG. 1. A, *Polysiphonia dotyi*, portion of a prostrate branch showing rhizoid in open connection with the pericentral cell and ornately digitate tip. B, *Polysiphonia dotyi*, apex of branch, showing trichoblasts and origin of young lateral in connection with a trichoblast (the shoot apex and the young lateral branch are stippled). C, *Polysiphonia exilis*, apex of branch. D, *Polysiphonia howei*, apex of prostrate branch with exogenous laterals and rhizoids at distal end of pericentral cells. E, *Polysiphonia howei*, showing multicellular tip of mature rhizoid. F and G, *Polysiphonia tsudana*, with young and older spermatangial stichidia.





FIG. 4. *Polysiphonia dotyi*, photomicrograph of a vegetative branch apex.

4–6 unequal dichotomies, soon deciduous leaving small scar-cells in both prostrate and erect branches; tetrasporangia to  $100\mu$  in diameter, in spiral sequence near branch apices, considerably distending the segments at maturity; spermatangial branches  $140\text{--}200 \times 60\text{--}75\mu$ , oblong with broadly rounded tips, arising as a primary branch of a trichoblast.

Plantae praecipue prostratae aut interdum scandentes; rami prostrati erectique plerumque  $140\text{--}160\mu$  diam.; rhizoidea unicellularia, plerumque discoidea, interdum multicellularia; connectionem latam apertamque cum cellulis pericentralibus habentia; rami erecti non numerosi,  $0.5\text{--}1.0\text{--}(10)$  mm alt., segmentis plerumque brevioribus quam lata, necnon tumidis, praecipue supra; rami laterales pauci, in associatione cum trichoblastis enascentes; cellulae pericentrales plerumque 8–10, ecorticatae, in segmentis successive ex ordine sitae; trichoblastae una in unoquoque segmento, per unam cellulam pericentralem inter trichoblastas successivas spiraliter versae; maxima ex parte elementariae, interdum, autem, ad 1.2 mm long., et 4–5 dichotomias inaequales habentes, mox deciduae, cellulas-cicatrices parvas in ramis et prostratis et erectis relinquentes; tetrasporangia ad  $100\mu$  diam., in spira prope apices ramorum, dum maturerent segmenta aliquantum distendentes; rami spermatangiales  $140\text{--}200 \times 60\text{--}75\mu$ , oblongi, in cacuminibus late rotundati, ut ramus primarius trichoblastae enascentes.

TYPE: H. 48–1213.16, tetrasporic, Amen I., Bikini Atoll, July 7, 1948.

ADDITIONAL COLLECTIONS: PHOENIX ISLANDS—L. 2433.2, spermatangial, on *Halimeda* sp., McKean I., Oct. 19, 1964; MARSHALL ISLANDS



FIG. 5. *Polysiphonia dotyi*, photomicrograph of a branch apex bearing spermatangial stichidia.

—D. 9693A, on reef drop-off, lagoon side near Ine Village, Arno Atoll, legit Leonard Horwitz, Aug. 22, 1951; H. 48–0914.25, outer reef, Uku I., Bikini Atoll, July 9, 1948; H. 48–1091.15, on *Pocockiella*, outer reef Arji I., Bikini Atoll, July 12, 1948; H. 48–2894.6, tetrasporic, on *Udotea* sp., Nama I., Bikini Atoll, July 15, 1948; CAROLINE ISLANDS—D. 23688.2, on dead coral on reef at Quoi I., Truk Group, legit E. Meñez, Aug. 2, 1960.

An unusual feature of this species is the broad open connection of the rhizoids with the pericentral cells. The writer is not aware of this feature occurring in any other species with more than 4 pericentral cells. A feature which it shares with only a few species, including *P. howei*, is the offset position of the pericentral cells.

*Polysiphonia exilis* Harvey, 1853:47

Figs. 1C, 3C

Plants epiphytic or on dead coral, chiefly prostrate, attached by unicellular rhizoids, commonly with digitate or bulbous tips, cut off by a cross-wall from the center or proximal end of the pericentral cells, mostly short but occasionally as much as 2 mm long; pericentral cells mostly 9–11, around a relatively large central cell, ecorticate, in straight rows longitudinally; walls to  $20\mu$  thick, often stratified; erect branches 3–6 mm high and  $160\text{--}170\mu$  in diameter, with segments mostly  $0.5\text{--}0.75$  diameters long, arising almost exclusively cicatrigenously from the prostrate branches and having few or no lateral ramuli; trichoblasts on erect

branches commonly well developed, as much as 2 mm long and 28–40 $\mu$  in diameter at the base, with mostly 3–5 dichotomies, the final branches tapering to delicate tips; trichoblasts arising one per segment on erect branches, with 2 pericentral cells and approximately  $\frac{1}{4}$  spiral turn between successive trichoblasts, mostly soon deciduous but often relatively persistent, leaving small scar-cells and prominent wall-scars at the point of abscission; scar-cells on prostrate branches often 2 or more segments apart; tetrasporangia 50–65 $\mu$  in diameter, in spiral sequence in the tips of erect branches, not much distending the segments; sexual plants unknown.

TYPE LOCALITY: Key West, Florida.

COLLECTIONS EXAMINED: HAWAIIAN ISLANDS—D. 18713, Midway I., legit C.H. Lamoureux, Oct. 6, 1962; D. 19127U, dredged 10–14 fa, Pokai Bay, Oahu, July 30, 1959; MARSHALL ISLANDS—D. 9691.1 tetrasporic, D. 9692A, tetrasporic, D. 9696A, lagoon reef drop-off, Ine Village, Arno Atoll, legit Leonard Horwitz, Aug. 22, 1951; H. 48–0290.2, inner reef, Eric I., Bikini Atoll, July 13, 1948; H. 48–0914.18, on *Pocockiella* sp., outer reef, Uku I., Bikini Atoll, July 9, 1948; H. 48–Y58.2, on dead coral, Biiijiri I., Eniwetok Atoll, July 26, 1948; H. 48–Y72, on other algae, Runit I., Eniwetok Atoll, July 27, 1948; CAROLINE ISLANDS—all legit E. Meñez, Aug. 1960: D. 15413.1, D. 15416.1, on *Hypnea* sp., eastern part of Helen Reef, Aug. 28, 1960; D. 15897.8, tetrasporic, on dead coral, reef at Quoi I., Truk I., Aug. 1, 1960; D. 23187.2, D. 23751.2, D. 23756.2, on coral and on other algae, Quoi I., Truk I., Aug. 2, 1960; D. 23565, tetrasporic, on other algae, reef of Iwayama Bay, Palau I. (7°20'N, 134°31'E).

Examination of a fragment of the type, W.H.H.24, kindly sent from the Harvey Herbarium at Trinity College, Dublin, by Hilda Parks, reveals features which in detail correspond closely with those of the Pacific specimens, leaving little room for doubt concerning the identity of the latter, even though they are considerably smaller and with fewer lateral branches than the type. Another minor difference may be mentioned. The central cell is relatively small in the type material but is usually

nearly twice as broad as the pericentral cells in the Pacific specimens.

A specimen which seems to be a variant of *P. exilis* is represented by D. 18713, collected by Charles H. Lamoureux, Midway I., Dec. 16, 1962, cast ashore following a heavy storm. The erect branches are unbranched and slightly smaller than those of other Pacific specimens of *P. exilis*. There are 14 pericentral cells. Trichoblasts tend to occur at intervals of 2–4 segments rather than on every segment, as is typical for the species. The plants were sterile.

*Polysiphonia homoia* Setchell and Gardner  
1930:162; Hollenberg 1961:356

Fig. 2B

Plants flaccid, epiphytic, to 3 cm high, attached by a basal tuft of unicellular rhizoids, mostly with digitate tips and cut off by cross-walls from an original basal cell (spore?) and from adjacent pericentral cells; 5 pericentral cells, ecorticate, with walls thin and hyaline except near the base, and with segments in main axes to 2.5 diameters long and with clear dissepiments; main axis 100–420 $\mu$  in diameter, of segments 1.5–2.5 diameters long; branches arising in connection with trichoblasts, at intervals of mostly 6–12 segments, slightly narrowed at the base; branching mostly pseudodichotomous; trichoblasts at irregular intervals, mostly 2–3 segments apart in  $\frac{1}{5}$  spiral sequence, up to 400–550 $\mu$  long with 4–6 dichotomies and slender tapering tips, with basal cell very short and with the cell next to the basal cell about 15 $\mu$  in diameter and up to 6 diameters long; tetrasporangia to 55 $\mu$  in diameter, in short slightly spiral series, not much distending the segments; cystocarps slightly ovate to nearly globular and 200–240 $\mu$  in diameter, with ostiolar cells prominently enlarged at maturity in comparison with cells immediately below them; spermatangial branches measuring 200–275  $\times$  40–45 $\mu$ , arising as a primary fork of a trichoblast, without sterile tip.

TYPE LOCALITY: Guadalupe I., Lower California, Mexico.

Central Pacific collections are from the Hawaiian Islands only: D. 19144C1, on *Galaxaura* sp. dredged 6–13 fa, Port Allen, Kauai, Nov. 12, 1959; D. 19104E1, and D. 19104F1,



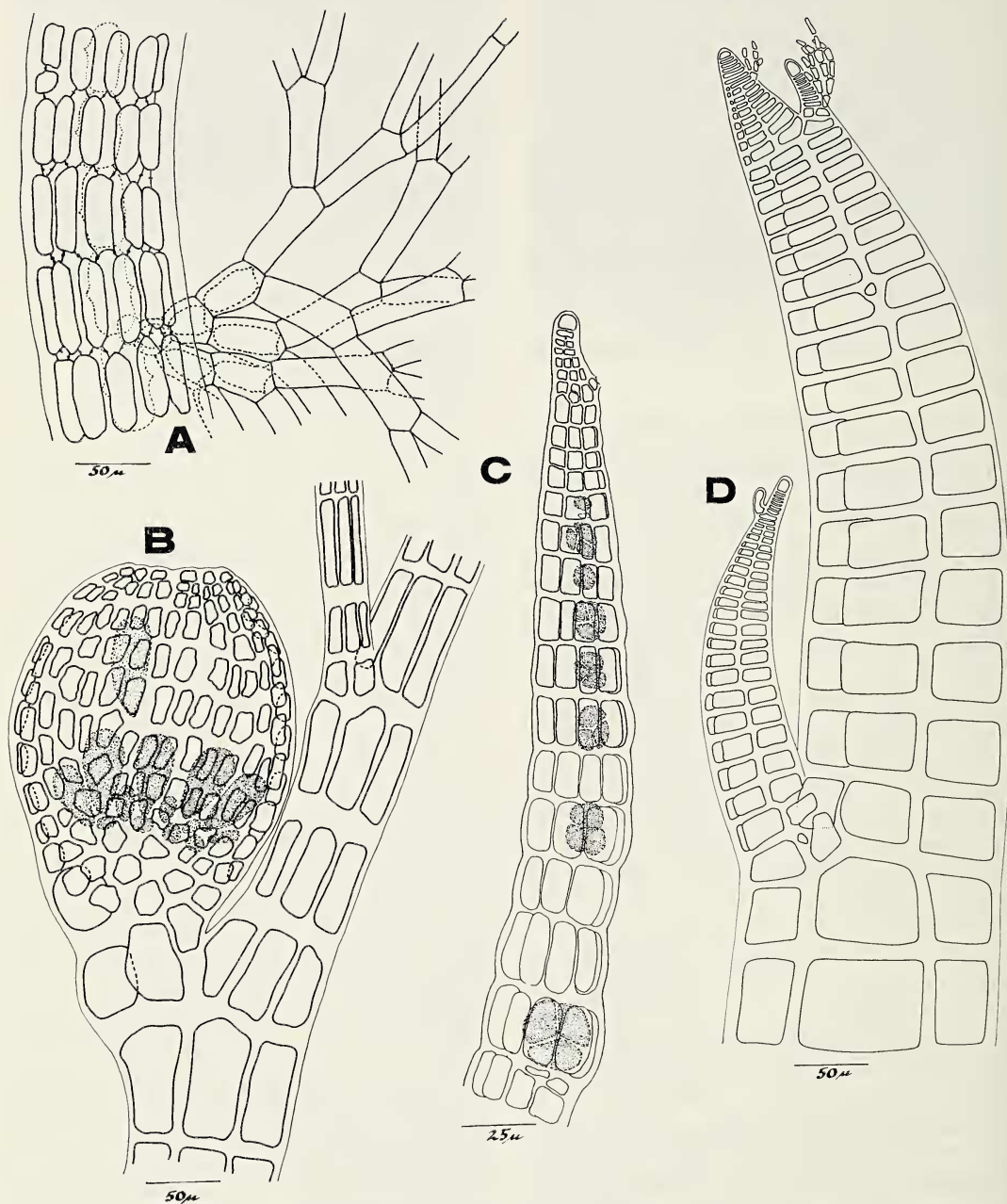


FIG. 2. A, *Polysiphonia howei*, portion of a branch showing pericentral cells in offset positions, with two secondary pit connections with pericentral cells of adjacent segments; also showing the characteristically short basal cell of a trichoblast. B, *Polysiphonia bomoia*, cystocarp (immature). C, *Polysiphonia tsudana*, tetrasporangial branch. D, *Polysiphonia pentamera*, apex of a branch, showing laterals and trichoblasts.

cystocarpic, on *Gracilaria*, 20–55 fa, Explosive Ammunition Area, Oahu, July 24, 1959; D. 19118A1, on *Cnoospora* sp. 16–25 fa, Pokai Bay, Oahu, Aug. 1, 1959; D. 19134D1, on other algae, 25 fa, outside channel buoy, Kaneohe Bay, Oahu, July 25, 1959; D. 19135Z1, spermatangial, on *Hypnea* sp., 26 fa, Waialua, Oahu, Aug. 2, 1959; D. 19136F3, cystocarpic, 15 fa, Waialua, Oahu, Aug. 2, 1959; D. 19143T1, cystocarpic, on *Liagora* sp., 15 fa, Ilio Point, Molokai, Sept. 7, 1959.

This alga seems to be a plant of deeper water. It compares favorably in most respects with the description of the type and previously the only known collection of this plant. It differs in two respects: (1) the tetrasporangia are reported as occurring in straight series in the type material, and (2) the type is described as having a short sterile tip on the spermatangial branches.

*Polysiphonia howei* Hollenberg, in Taylor 1945:302; Hollenberg 1958:64.

*P. rhizoidea* Meñez 1964:217, *P. yonakuniensis* Meñez 1964:219, *P. yonakuniensis* Segi 1951:257, *Lophosiphonia obscura* Weber v. Bosse (1923) not of Falkenberg 1901:500

Figs. 1D, 1E, 2A

Plants forming low dense mats on rocks, up to 1.5 cm high and to 7 cm or more in diameter; prostrate branches 100–170 $\mu$  in diameter attached by unicellular rhizoids, with digitate to multicellular tips, often several per segment, each cut off by a cross-wall from the distal end of the pericentral cell; erect branches 100–150 $\mu$  in diameter, arising exogenously at the tips of prostrate branches, or sometimes cicatrigenously, at intervals of 6–8 or more segments, at first strongly curved toward the apex of the prostrate branch, and bearing frequent, mostly curved, lateral branches; prostrate branches giving rise ventro-laterally to prostrate lateral branches in alternating positions on either side mostly 2 segments distal from each erect branch; 8–10 pericentral cells around a relatively large central cell, the pericentral cells, beginning 8 or more segments from the branch tip, shifting to offset positions, so that each pericentral cell is in contact at either end with 2 pericentral cells of the adjacent segment, with each of which it soon

develops 1, or sometimes 2, secondary pit connections; segments in prostrate and erect branches mostly less than 1 diameter long; trichoblasts relatively coarse, to 600 $\mu$  long and 28 $\mu$  in diameter at the base, with short basal cells, even at maturity, and with about 4 dichotomies, not diminishing greatly toward the rounded tips, arising at no regular intervals but frequently, one per segment in  $\frac{1}{4}$  spiral sequence, at least in upper parts; tetrasporangia 45–55 $\mu$  in diameter, in spiral series in the ultimate branches, not distending the segments; cystocarps ovoid, 175–200–(360) $\mu$  in diameter; spermatangial branches near branch tips 120–170 $\mu$  long and 35–50 $\mu$  in diameter on a sturdy 1-celled stalk, without a sterile tip, arising from the entire trichoblast primordium or frequently one from each primary branch of the trichoblast.

TYPE LOCALITY: Berry I., Bahamas.

MATERIAL EXAMINED includes the following: HAWAIIAN ISLANDS—D. 8461, 8462, tetrasporic, Kaneohe Bay, Oahu, Nov. 24, 1950; D. 10816, Kapoho Point, Kailua, Oahu, Oct. 10, 1953; Josephine E. Tilden 602, tetrasporic, Laie Point, Oahu, June, 1900 (as *P. calothrix* Harvey); D. 13448, 13458B, tetrasporic, on basalt ledge, west lip of Pohoiki Bay, Island of Hawaii, legit M. S. Doty and A. J. Bernatowicz, Nov. 10, 1956; D. 13076, Anaehoomalu, Island of Hawaii, legit Amy Sollenwell, Nov. 15, 1952; D. 17220A, Punaluu Bay, Island of Hawaii, Jan. 29, 1953; D. 17304, low mats on lava, Laupahoehoe Point, Island of Hawaii, Jan. 28, 1953; D. 19256, tetrasporic, spermatangial on prehistoric lava flow dike, east of 1955 flow, 6–8 inches above high tide level, Keekee, Island of Hawaii, Dec. 23, 1959; D. 19354, in shaded crevices of 1955 lava flow, Keekee, Island of Hawaii, Sept. 8, 1960; D. 19359, King's Landing, Panaewa, Island of Hawaii, Sept. 13, 1960; AMERICAN SAMOA—T. 701–704, on intertidal basalt, mouth of Fagasa Bay, Tutuila I., Aug. 21, 1964; T. 682, on a log above high tide level, Afono, Tutuila I., Aug. 22, 1964; PHILIPPINE ISLANDS—D. 16198, above low tide, western shore of Cuenco I., Hundred Islands, Pangasinan Prov., legit M.S. Doty and E. Meñez, Feb. 15, 1958; D. 18077B, tetrasporic, cystocarpic, south of Sasa wharf, Davao, legit E.



Meñez, July 26, 1958; EAST INDIES (Siboga Expedition collections loaned from Rijksherbarium, Leiden, and identified by Mme. Weber v. Bosse as *Lophosiphonia obscura*)—Sta. 14, Kangean I., east of Java, Mar. 14, 1899; Sta. 165, Fausses Pisangs I., west of New Guinea, Aug. 20–22, 1899; Sta. 277, Dammer I., east of Timor, Jan. 9–11, 1900; Sta. 296, coast of Timor, Jan. 24–26, 1900; SINGAPORE—D. 16425A, on mangrove stems and roots at sea edge of mangrove swamp near Caltex refinery, Paudan Nature Reserve, Nov. 31, 1957; CEYLON—W. Ferguson, Ceylon Algae 239 (as *Lophosiphonia obscura*), Rijksherbarium.

The wide distribution of *P. howei* in the Atlantic and Pacific Oceans was previously reported by Hollenberg (1958:64). The present study extends the distribution westward to the Indian Ocean and shows that this species is common throughout the tropical Pacific. Furthermore, a collection by J. Feldmann at Roscoff, France, Aug. 25, 1946, is probably to be identified with this species. Erect branches arise in the characteristic exogenous manner from prostrate branches, and the specimens exhibit most of the detailed features of the species, although the rhizoids arise from the middle of the pericentral cells instead of from the distal end. Hence it seems probable that *P. howei* occurs also in southern Europe.

*Polysiphonia pentamera* sp. nov.

*P. fragilis* Tsuda 1964:11, not of Suringar 1870:37. *P. mollis*? Weber v. Bosse (1923:356) (in part), not of Hooker and Harvey.

Fig. 2D

Plants epiphytic with prostrate branches 2–3 cm long and (115)–175–200 $\mu$  in diameter, and with segments mostly shorter than their diameter, attached by unicellular rhizoids which are cut off from the pericentral cells by a cross-wall; assurgent erect branches to 3.5 cm high of a similar diameter and with segments about 1 diameter long in older parts and very short in younger terminal parts; branching mostly exogenous, sometimes cicatrigenous, pseudo-dichotomous and occasionally somewhat distichous, at relatively wide angles and at intervals of (6)–12–25 segments, the branches not constricted at the base, arising in connection with

trichoblasts; pericentral cells 5, ecorticate; walls hyaline, firm, and of moderate thickness, mostly but little constricted at the clear dissepiments; trichoblasts mostly at intervals of 12–14 or more segments, with 3–4 dichotomies, quickly deciduous, leaving small scar-cells; tetrasporangia about 55 $\mu$  in diameter in very long, slightly spiralling series up to 60 or 70 in the upper branches; sexual reproduction unknown.

Plantae epiphyticae, ramos prostratos 2–3 cm long. et (115)–175–200 $\mu$  diam., segmentis plerumque brevioribus quam lata habentes; per rhizoidea unicellularia quae a cellulis pericentralibus per dissepimentum separantur affixae; rami erecti assurgentes ad 3.5 cm alt., ramis prostratis diametro similes, segmenta in partibus vetustioribus aequae longa ac lata et in partibus iuvenibus terminalibus brevissima habentes; rami plerumque exogeni interdum cicatrigenae, pseudo-dichotomi et interdum satis distichi, angulis relative latis, intervallis (6)–12–25 segmentorum, ramis ad basin non constrictis, in associatione cum trichoblastis enascentibus; cellulae pericentrales 5, ecorticae; parietes hyalini firmi satis crassi, ad dissepimenta manifesta saepissime vix constricti; trichoblastae plerumque intervallis 12–14 vel plurim segmentorum dispositae, 3–4 dichotomias habentes, cito deciduae, cellulas-cicatrices parvas relinquentes; tetrasporangia ca. 55 $\mu$  diam. 60–70 in serie longissima subspirali in ramis superioribus; reproductio sexualis ignota.

TYPE: G. 524.2, tetrasporic, from a depth of 28 m, in the lagoon, Eniwetok Atoll, Aug. 30, 1955.

ADDITIONAL COLLECTIONS: HAWAIIAN ISLANDS—D. 19135W2, on other algae, dredged 26 fathoms, Waialua, Oahu, Aug. 2, 1959; GILBERT ISLANDS—D. 18937A, from a coral reef, Marakei I., legit M. J. Cooper, July, 1962, and identified by Tsuda (1964:11) as *P. fragilis* Suringar; CAROLINE ISLANDS—D. 21223.1, tetrasporic, creeping on a *Padina* sp., on a reef flat near the bridge between Kolonia and Jokai I., Ponape Group (6°58'N, 158°11'E), legit E. Meñez, June 25, 1960; EAST INDIES—two collections made on the Siboga Expedition and identified by Weber v. Bosse (1923) as *P. mollis*? Hooker and Harvey; Sta. 77, on other algae dredged 40–60 m, Borneo Bank, southeast of Borneo, June 12, 1899; Sta. 133, Lirung, Salibabu I., "flottant le long du bateau," July 25–27, 1899; VIETNAM—Da. 11277, tetrasporic, as *P. fragilis* Suringar, Ile de Tre; Da. 11278A, tetrasporic, as (*P. coacta* Tseng) from Nhatrong, Feb. 16, 1952.

This species resembles *P. fragilis* Suringar as interpreted and figured by Okamura (1929, Vol. VI: Pl. 255, figs. 1–15). However, Okamura describes trichoblasts as arising one per segment. Segi (1951:251, as *P. forcipata* Harvey) describes and figures a similar plant with trichoblasts on every segment. *P. pentamera* also resembles *P. polyphysa* Kützinger, collected by Vieillard in New Caledonia, and figured in Kützinger (1863, Vol. 13:20). *P. polyphysa* is described as having 5 pericentral cells and very short segments, but the branch apices are described as forcipate, and the pericentral cells as "valde inflatis."

*Polysiphonia tepidia* Hollenberg 1958:65

*P. flabellulata* of Meñez 1964:219, (non *P. flabellulata* Harvey 1860:330); ?*P. dennudata* Taylor (1960) as concerns non-corticated forms  
Fig. 3D, 3E

Plants 1–8 cm high, very soft and flaccid, assurgent from a brief prostrate base attached by numerous unicellular rhizoids, which are cut off by a cross-wall mostly from the proximal end of the pericentral cells, which may have digitate tips and may be as much as 1.3 mm long; pericentral cells mostly 7, sometimes 6 in upper branches, or 8 at the base, ecorticate, with segments in median parts of main erect branches mostly 1–1.5 diameters long and 140–250 $\mu$  in diameter; walls thin and hyaline or thick and stratified in lower parts; main axes not prominent, branching pseudodichotomously at wide angles up to 45 degrees below, at very narrow angles and somewhat distichous in upper parts, with 4–10 or more, but mostly 8, segments between successive branches; branches arising in connection with trichoblasts; trichoblasts commonly 1–2 between successive branches, often poorly developed, but sometimes well developed, 200–500 $\mu$  long and with 2–3 forks and delicate tips, mostly soon deciduous, leaving small scar-cells; tetrasporangia 50–70–(95) $\mu$  in diameter, in short or longer straight series in the ultimate and subultimate ramuli; cystocarps subglobose and about 160 $\mu$  in diameter, according to Meñez (1964:219). I observed only immature cystocarps; spermatangial branches not observed in the material examined, but de-

scribed by Meñez as arising as a primary branch of a trichoblast.

TYPE LOCALITY: Beaufort, North Carolina, United States mainland.

COLLECTIONS EXAMINED (all from the Hawaiian Islands): D. 9765A, tetrasporic, near the Army Gate, Sand I., Oahu, Jan. 27, 1952; D. 18020, tetrasporic, cystocarpic, Kaneohe Bay, Oahu, Oct. 10, 1953; D. 19756, tetrasporic, scraped from the hull of a boat in Ala Wai Yacht Harbor, Honolulu, Oahu, Nov. 14, 1951; H. 62–12, from an aquarium of sea water in which fish were being reared and fed the *Polysiphonia* for food, Sans Souci Beach Laboratory, Waikiki, Oahu, Dec. 3, 1962; an unnumbered collection, by I. A. Abbott, from Keawanui Pond, Molokai, Aug. 24, 1944.

A plant described and figured by Boergesen (1918:269, figs. 263, 264) may be *P. tepida*, although Boergesen's fig. 264 shows rhizoids in open connection with the pericentral cells.

*Polysiphonia tsudana* sp. nov.

*Polysiphonia* sp. of Tsuda 1965:21

Figs. 1F, 1G, 2C

Prostrate branches 40–62 $\mu$  in diameter, composed of segments about 1 diameter long, attached by unicellular rhizoids, which are cut off by a cross-wall from the center or distal end of the pericentral cells; erect branches arising mostly cicatrigenously at close but irregular intervals, to 4 mm high and 45–50 $\mu$  in diameter, mostly unbranched, with segments 1 diameter long or less; pericentral cells 4 in the prostrate branches, 6–9 in erect branches, about the same size as the central cell, ecorticate, commonly of unequal length in a given segment and not strictly in longitudinal rows; trichoblasts infrequent and very rudimentary, but primordia (or scar-cells) commonly one per segment and in mostly  $\frac{1}{4}$  spiral sequence, except in tetrasporangial branches where they are unilateral; tetrasporangia about 36 $\mu$  in diameter, one per segment in short, non-spiralling series, somewhat distending the segments; spermatangial branches (immature) lanceolate, to 65 $\mu$  long, apparently without a sterile tip, on a very short, 1-celled pedicel, arising from the entire trichoblast primordium; cystocarps unknown.



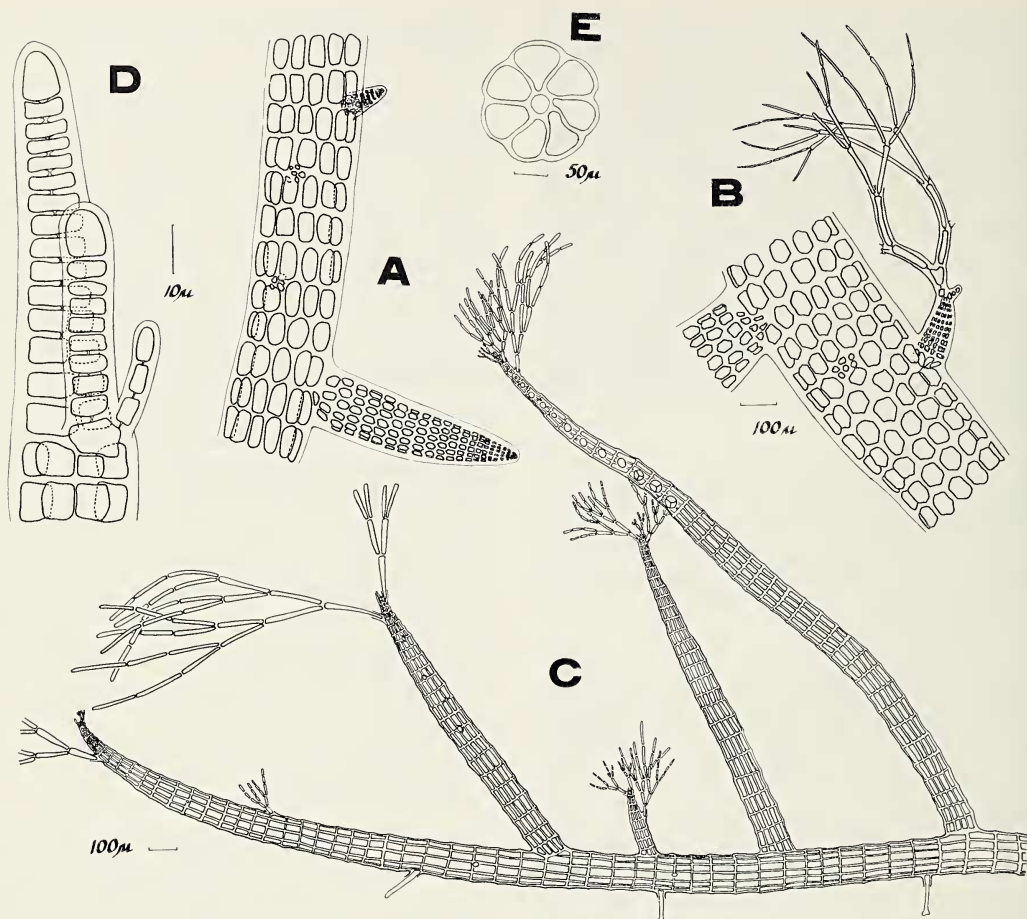


FIG. 3. A and B, *Polysiphonia?* sp. (scale for B applies to A as well). C, *Polysiphonia exilis*, prostrate branch and erect branches. D and E, *Polysiphonia tepida*.

Algae minutae, ramos prostratos 40–60 $\mu$  diam. et segmenta aequa longa ac lata habentes, rami per rhizoidea unicellularia, ut cellulae discretae separatae, affixi; rami erecti ad 4 mm alt., 40–50 $\mu$  diam., plerumque non ramosi, segmentis plerumque ac longis ac latis aut brevioribus; cellulae pericentrales 4 in ramis prostratis et 6–9 in ramis erectis; trichoblastae rarae elementariaeque, primordiis vulgo uno in unoquoque segmento in ramis erectis prostratisque, in spira ordinatis nisi in ramis tetrasporangialibus; tetrasporangia in serie brevi non spirali; rami spermatangiales e primordio trichoblastae toto enascentes; cystocarpi non observati; plantae in collo testudinis marinae colentes.

TYPE: T. 609, tetrasporic, spermatangial, scraped from the neck of a sea turtle, *Chelonia mydas*. It was collected by Roy T. Tsuda at Laysan I., Hawaii (25°48'N, 171°44'W), Dec. 8, 1963. It is represented by a single glucose mount.

The spiral arrangement of trichoblasts and scar-cells, which are unilateral only on tetrasporangial branches, and the cicatrigenous origin of erect branches, are features which exclude this alga from the genus *Lophosiphonia*.

No additional collections are available for study, but no other species of *Polysiphonia* closely approximates the distinctive features of this alga, especially the epizoic habitat, the minute size, the variable number of pericentral cells, and the origin of spermatangial branches from the entire trichoblast primordium.

*Polysiphonia* ? sp.

Fig. 3A, 3B

Plants to 1 cm high with prostrate branches 200–220 $\mu$  in diameter, attached by rhizoids

which are cut off as separate cells from the distal end of the pericentral cells and which may have multicellular tips; erect branches similar and slightly larger in diameter, arising endogenously or mostly cicatrigenously at intervals of 6–8 segments, each erect branch mostly 2 segments and  $\frac{1}{4}$  right-hand turn from another branch or a branch primordium, the latter usually composed of several cells; pericentral cells 8–(9?) ecorticate, composing segments mostly less than half as long as broad, with pericentral cells not in longitudinal rows but in offset position, resulting in a more or less hexagonal shape of the pericentral cells as seen in surface view; erect branches in turn bearing short, somewhat arcuate laterals and primordia; trichoblasts to 700 $\mu$  long, with about 5 dichotomies; arising at intervals of mostly 2–3 segments and  $\frac{1}{4}$  right-hand spiral, quickly deciduous, leaving scar-cells which quickly divide to form a cluster of small cells most of which remain as multicellular rudiments of potential branches; reproductive structures unknown.

A single collection, D. 17242.1, growing with a member of the Gelidiaceae, was collected by Jessie Kajimara at Ili Bridge, Halona, Oahu, Hawaii, Nov. 14, 1956.

This alga has very distinctive features, but the lack of reproductive structures makes its generic position uncertain.

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